SB761
A3A4
1971

Forest Insect & Disease Conditions

IN ALASKA DURING 1971

DEPARTMENT OF AGRICULTURE
FOREST SERVICE ALASKA REGION
DIVISION OF TIMBER MANAGEMENT

MAY 19

TABLE OF CONTENTS

Subject	Page
Introduction	1
Conditions in Brief	2
BARKBEETLES	
Spruce beetle - white spruce	2
Cedar barkbeetle	6
DEFOLIATORS	
Western blackheaded budworm	6
Hemlock sawfly	8
Saddleback looper	10
Green-striped forest looper	10
OTHER INSECTS	
Spruce aphid	11
Coolley spruce gallaphid	11
Noctuiid defoliator	11
Unknown sawfly	11
Unknown spittlebug	11
DEFOLIATOR SURVEY	12
FOREST DISEASES	
Conditions in Brief	14
Stem Diseases of Conifers	
Hemlock Dwarfmistletoe	14
Hemlock dieback	17
Gall rust	18
Foliage Diseases of Conifers	
Needlecast	18
Needlerust	18
ILLUSTRATIONS	
Figure 1 - Area of spruce beetle infestation on Kenai Peninsula	4
Figure 2 - Distribution of major larval defoliator populations	7
Figure 3 - Distribution of visible defoliation	9
Figure 4 - Larval sampling locations	13

INTRODUCTION

A variety of insect and disease organisms rank high among the important damaging agents of Alaskan forests. Although the activities of these pests is often less spectacular than that resulting from fire or wind they usually account for greater annual losses.

One of the primary roles of a pest manager in the practice of forestry is to provide land managers with information concerning the occurance, relative abundance, and damage potential of the various occurring destructive agents and to provide information that can be used to prevent or reduce to an acceptable minimum losses resulting from these pest activities.

Entomologists assigned to the Regional Office in Juneau, Alaska, have the responsibility for detecting and evaluating outbreaks of insects and disease on forest lands within the State and determining the losses caused by these agents.

To accomplish this responsibility, aerial and ground surveys are conducted annually to discover new problems and to monitor existing outbreaks. As needed, biological evaluations and impact surveys are made to provide biological inputs for sound management decisions. In addition, a program of scheduled training and technical assistance is provided to field personnel of the Forest Service, other federal agencies, and the State of Alaska.

A number of detection surveys and a variety of evaluations were conduted on National Forest and other federal agency lands in Alaska during 1971. These included:

1. Aerial surveys in southeast Alaska and the Kenai Peninsula to detect and monitor defoliator and spruce beetle outbreaks.

2. A systematic ground sampling survey to monitor the status of larval defoliator populations in coastal forests of southeast Alaska.

3. An evaluation to determine the status of spruce beetle populations on the Kenai Peninsula. This included establishing semi-permanent trend plots and completing the color photography phase of a double sample technique.

4. An extensive ground survey to determine the disease potential of young-growth stands in southeast Alaska.

5. An evaluation to measure the impact of defoliation caused by the saddleback looper on a stand of western hemlock.

Considering the size of our staff and the areas involved this job would be an impossible task except for the detection and reporting effort of field personnel from the various federal and State land management agencies and the able assistance and cooperation provided by personnel from the Forestry Science Laboratories located at Juneau and Fairbanks, Alaska.

The following report is a summary of insect and disease conditions that have been detected and evaluated on National Forest and other lands in Alaska during the 1971 field season.

INSECT CONDITIONS IN BRIEF

The spruce beetle outbreak continued in portions of the white spruce stands on the Kenai Peninsula with increased tree killing in a few old locations and the development of some new centers. Overall the amount of mortality produced by this pest has decreased. The scattered infestations in the southcentral and Interior portions of the State are declining. Portions of the chronic infestation in the Granite Creek drainage on the Anchorage Ranger District which was treated in 1968-1970, remained at endemic levels. The anticipated spruce beetle build-up in scattered blowdowns on portions of the Chugach National Forest has not materialized.

Defoliation by the hemlock sawfly was observed at several locations in the southern portion of southeast Alaska. The damage was generally light to moderate except for one area on the west side of McKenzie Inlet on Prince of Wales Island where continuous feeding over the past four years has resulted in top killing and some mortality. Western blackheaded budworm populations virtually vanished from the Prince William Sound and continued mostly at low levels throughout southeast Alaska. Visible defoliation was observed at one location in Princess Bay on Revillagigedo Island.

Defoliation caused by an unknown sawfly on alder was observed at river bottom locations near Juneau and Wrangell. A spittle bug was observed on Sitka spruce seedlings at several locations on Mitkof Island near Petersburg. Populations of the green spruce aphid have declined without causing further damage. No projects were undertaken to control defoliating or sucking insects during the past year.

BARK BEETLES

SPRUCE BEETLE, *Dendroctonus rufipennis* (kby). Spruce beetle activity continued to kill thousands of white spruce on the Kenai National Moose Refuge and adjacent State and private lands on the Kenai Peninsula. The acreage within the general zone of infestation has not significantly changed since last year. However, tree killing has increased in the northeast portion of the moose refuge between Falcon and Wonder Lakes

and around the south and west edges of Barabara Lake. On the eastern edge of the Refuge additional new centers estimated at 400 acres were observed along Mystery Creek from Fuller Lake downstream for approximately eight miles.

The present epidemic, active since 1966 and encompassing approximately 260,000 acres, has resulted in considerable mortality; with maximum losses estimated at nearly a billion board feet.

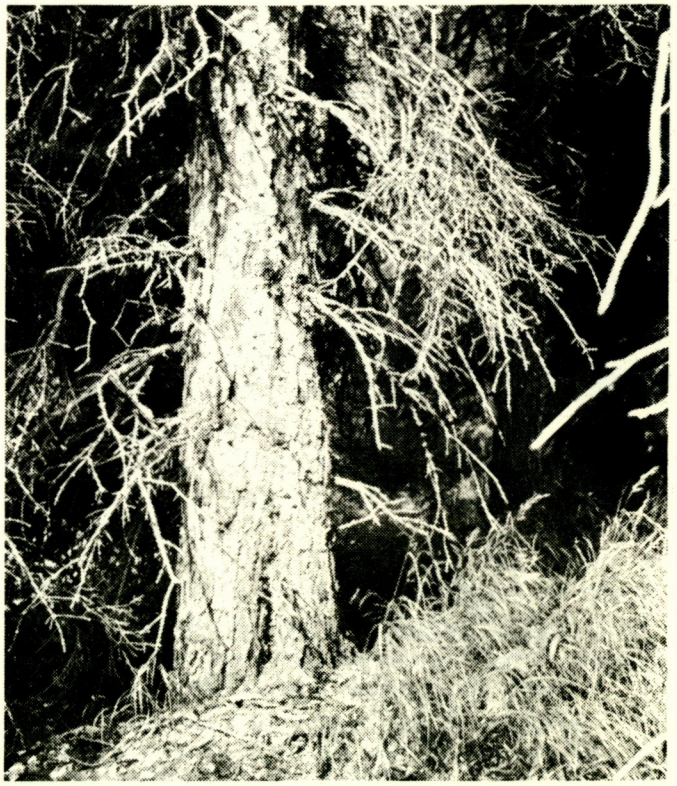
The areas of greatest mortality occur in the Swanson Lake Canoe System and in the vicinity of the Swanson River oil fields on the Kenai National Moose Refuge; on State and private lands in the vicinity of Stormy, Daniels, and Island Lakes on the northwest edge of the Kenai Peninsula; and on private and moose refuge lands from Soldatna to Clam Gulch.

The percentage of dead and green infested trees 5" DBH and larger, as determined from data taken on 17 one-fifth acre plots established throughout the infestation, averages about 25 percent (range: 4-75 percent by plot).

The greatest losses have occurred in the 10" and larger diameter classes. The average DBH of infested trees based on plot sample average is 11" with a range of 9-15" DBH.

The stands of pure spruce, containing 150 or more trees per acre, have been little affected by this outbreak. Growing stock losses, occurring primarily in the larger DBH classes, have averaged about 14 percent. However, in the mature mixed stands, consisting of fewer and larger diameter trees with little or no spruce regeneration, both the stand structure and stocking have been seriously affected.

Photo interpretation counts of 1969 and 1970 attacked trees in mixed stands on portions of the Swanson Lake Canoe System (by photography) have been as high as 1400 trees/40 acre photo plot. This indicates that mortality in some of these stands may be in the neighborhood of 70-100 trees per acre.



A mature white spruce newly attacked by the spruce beetle.

SPRUCE BEETLE INFESTATION
KENAI PENINSULA — 1971

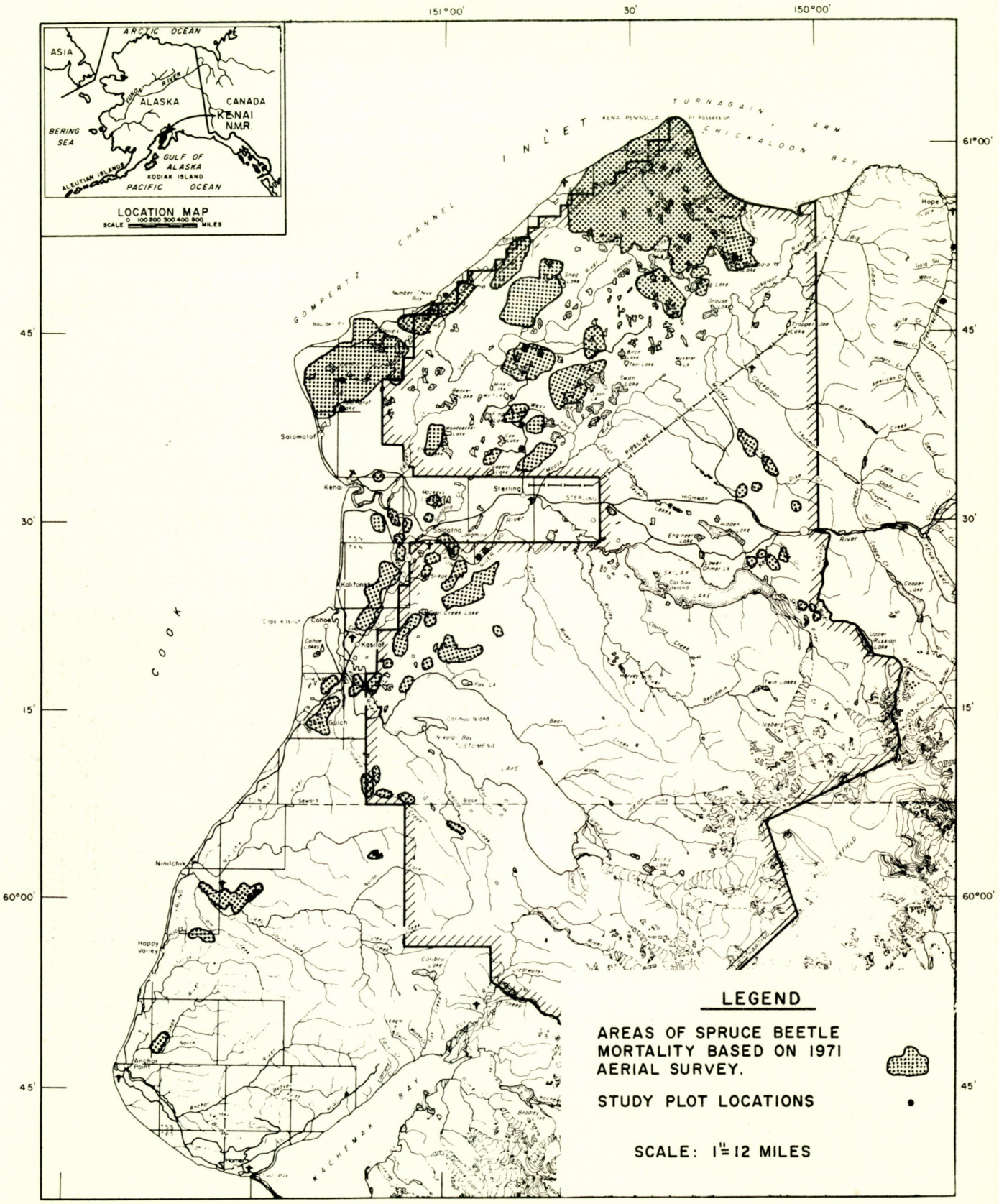


FIGURE 1

It appears that this outbreak has peaked and is now declining. A comparison of green infested, red-top, and older mortality counts from the 17 plots indicates that the greatest amount of tree killing occurred during the summer of 1969. This corresponds with weather data which indicates that 1968 and 1969 were the low precipitation seasons for the severe drought which is now subsiding.

Locally severe tree killing is expected to continue in stands that are now lightly infested and contain quantities of trees in the 10" and larger DBH classes. The broods in trees examined are vigorous and abundant and appear to be little affected by natural control factors. Considerable woodpecker feeding, occurring in trees that have been attacked since 1969, has had little noticeable effect in reducing the number of trees attacked.

The ultimate course of this outbreak will be largely determined by the type of weather occurring over the next two flight seasons and by the amount of suitable host material remaining in these infestation centers. No control is being considered.

A survey technique employing double sampling with regression (combining information from both photo and field plots) will be employed to obtain a more reliable estimate of mortality. The color photography phase of this operation was completed early last fall using a combination of color infra-red and aero-negative films. The ground phase is scheduled for completion in mid-June before green infested trees begin to fade.

Woodpecker activity in green infested white spruce. Notice the solid bark above the duff line where large numbers of adults and some larvae overwinter.

The anticipated buildup of spruce beetle populations in portions of the Six-Mile River and Resurrection Creek drainages and the Summit Lake area of the Anchorage and Kenai Ranger Districts has not materialized. Examination of blowdown resulting from a late 1969 storm indicates that light, widely scattered broods are developing, but pose no immediate threat to adjacent green trees. Emerging populations are expected to infest the remaining green blowdown during 1972-1973. No control is

being considered at this time. However, it is recommended that concentrations of blowdown material be logged within a year.

Subnormal summer temperatures and increased precipitation were apparently responsible for a general decline of scattered infestations in the south central and interior portions of the State. However, light mortality will continue to occur in recreation areas and stands adjacent to land clearing operations.

The treated portions of the chronic infestation on the Granite Creek drainage on the Anchorage Ranger District remained at endemic levels. Less than one green infested tree per ten acres of host type was found in either the control area or in adjacent stands.

However, small amounts of blowdown scattered throughout the control area were found to be lightly infested. It is assumed that spruce beetle activity in this area will remain at endemic levels for the next 1-2 years. No bark beetle control projects are planned for 1972.

Typical wind damage in white spruce stands on Kenai Peninsula. A high percentage of these trees have stem rot.

CEDAR BARK BEETLE, *Phloeosinus squamosus* (Blkm). Attacks by this beetle increased at several locations on Kupreanof, Prince of Wales, and Revillagigedo Island and along the mainland from Bradfield Canal to Portland Inlet. Tree killing was confined to stands growing on poor sites at middle and upper elevations. Low elevation stands of either red or yellow cedar do not appear to be affected.

DEFOLIATORS

WESTERN BLACKHEADED BUDWORM, *Acleris gloverana* (wlshm). Populations of this pest remained at endemic levels. The only suspected defoliation observed during the aerial detection survey occurred over approximately 50 acres at Princess Bay on Revillagigedo Island.

DISTRIBUTION OF MAJOR LARVAL POPULATIONS IN SOUTHEAST ALASKA-1971

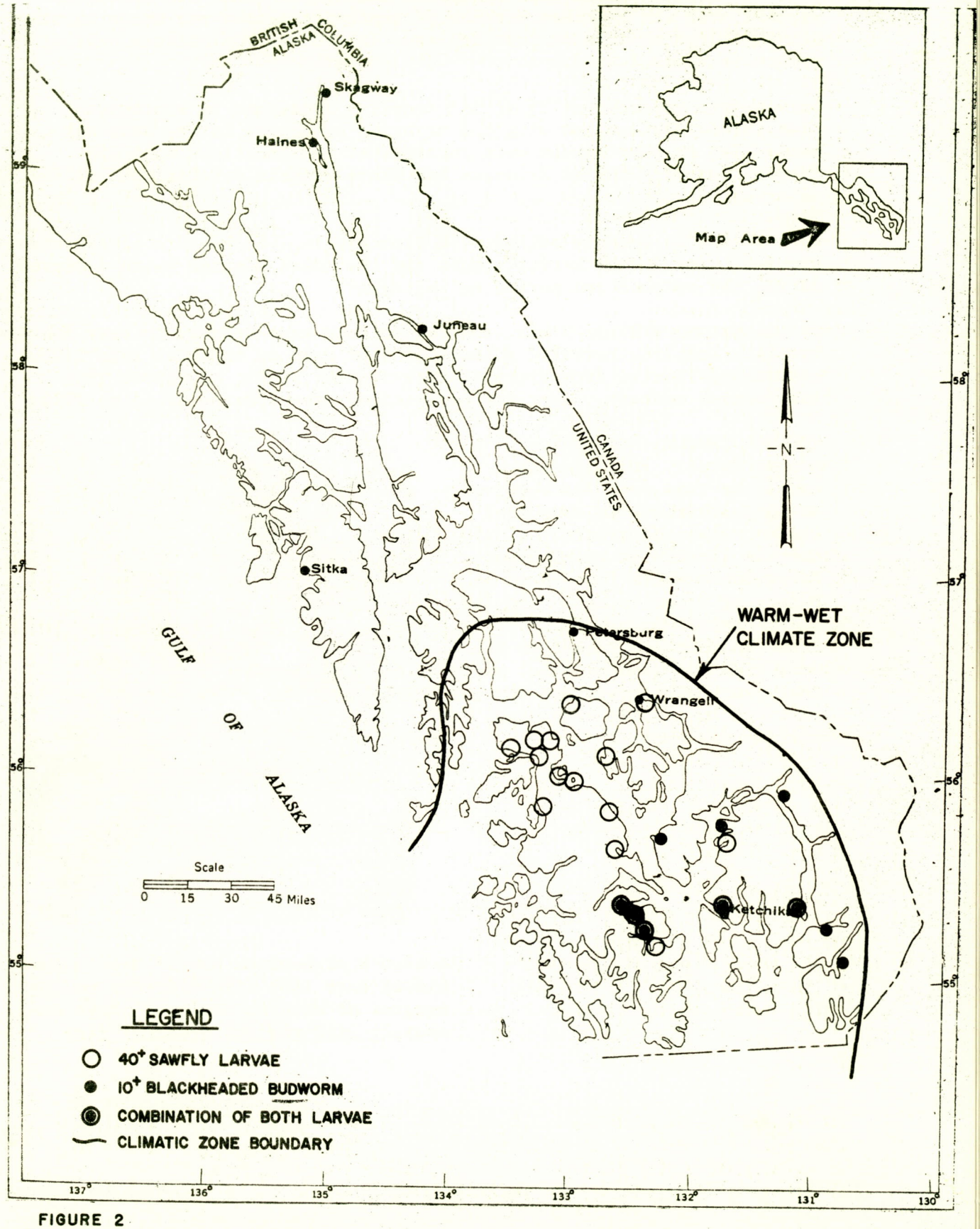


FIGURE 2

However, larval sample data indicates that populations are generally present over the southern portion of southeast Alaska and occur in relatively large numbers on Revillagigedo Island and the eastern half of Prince of Wales Island.

Larvae were recorded at 29 of 147 sampling locations in southeast Alaska this past season with the majority occurring in the warm-wet zone. Ten or more larvae were recorded at ten locations with the largest number (256) at Princess Bay where visible defoliation was observed.

An increase in budworm activity is expected in 1972 because of the high survival rate in the larval stages and the ideal weather which occurred during the oviposition period in September.

In the Prince William Sound area populations have dropped to very low levels. Sampling revealed a total of four eggs on the more than 1,000 branches collected from eight different areas within the three 1969 infestation centers. Very low populations are expected again in 1972.

HEMLOCK SAWFLY, *Neodiprion tsugae* (Midd). Defoliation caused by this pest was observed at many locations in southeast Alaska, with the majority of the centers located in the Cholmondeley Sound-Moira Sound area on Prince of Wales Island. The damage is variable, but generally light to moderate except on the west side of McKenzie Inlet where four years of infestation has resulted in limited amounts of top killing and mortality.

A clutch of hemlock sawfly eggs - individual eggs look like blisters on upper margins of several needles. Eggs are usually laid one per needle. (2x)

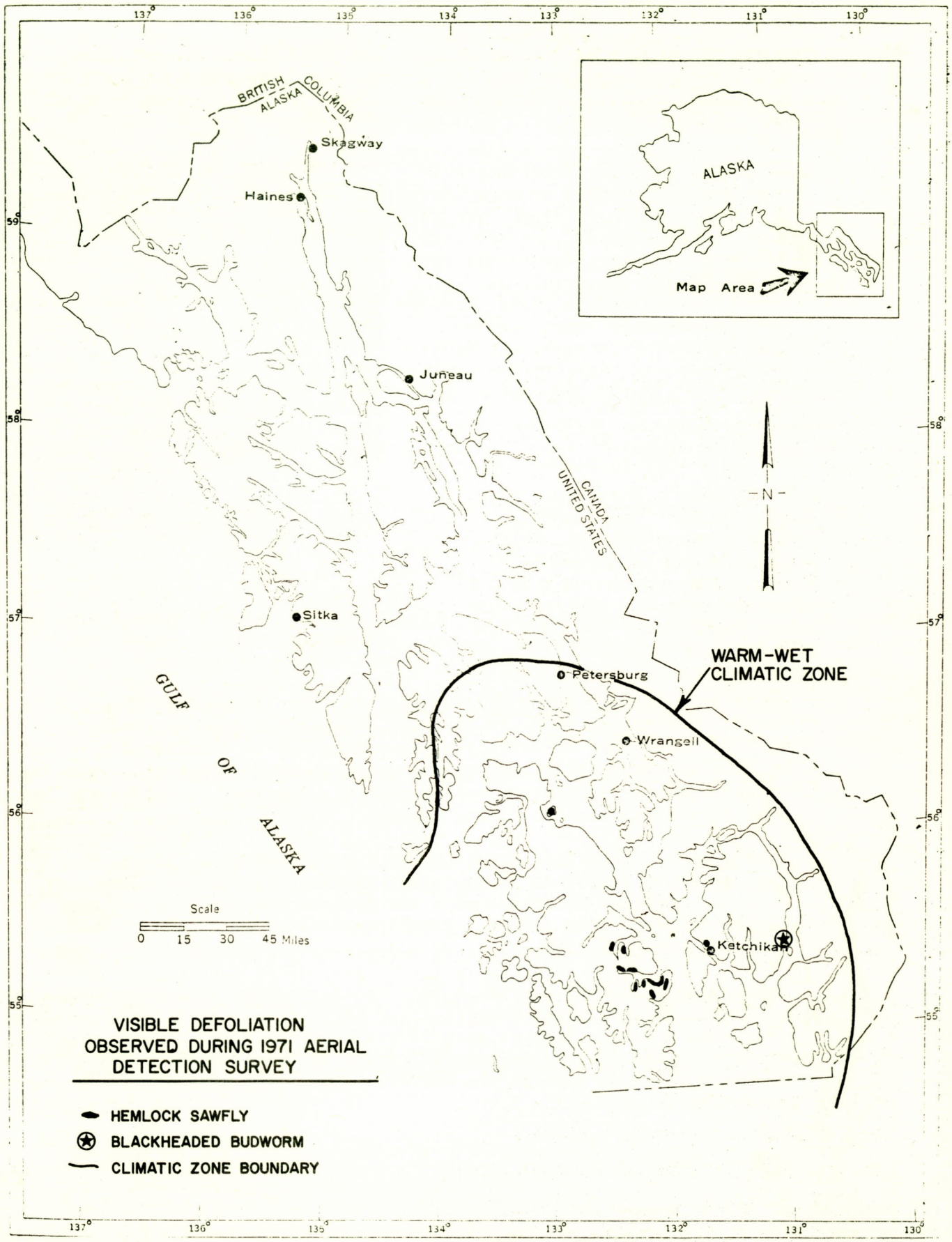
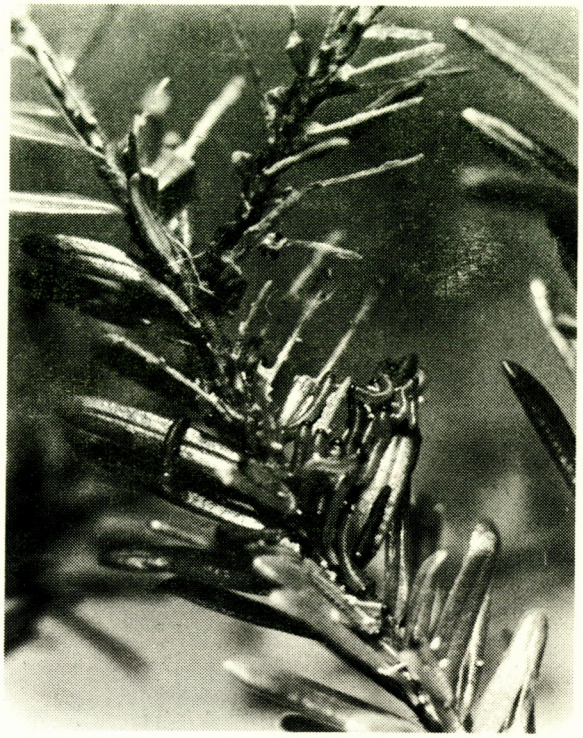

137°
136°
135°
134°
133°
132°
131°
130°
59°
58°
57°
56°
55°
BRITISH COLUMBIA
ALASKA
Skagway
Haines
Juneau
Sitka
GULF OF ALASKA
CANADA
UNITED STATES
ALASKA
Map Area
N
WARM-WET CLIMATIC ZONE
Petersburg
Wrangell
Ketchikan
Scale
0 15 30 45 Miles
VISIBLE DEFOLIATION OBSERVED DURING 1971 AERIAL DETECTION SURVEY
HEMLOCK SAWFLY
BLACKHEADED BUDWORM
CLIMATIC ZONE BOUNDARY

FIGURE 3

Sampling conducted in mid-summer indicates that larval populations are well distributed in the southern half of southeast Alaska with the majority occurring in the warm-wet zone. Larvae were collected at 47 of 147 sampling locations this past summer, with 40 or more larvae recorded at 21 locations. The largest number recorded was 999+ at Stevenson Island. No visible defoliation was observed, however there was noticeable light defoliation on adjacent Thorne Island where 900+ larvae were recorded. Populations of this insect are expected to greatly increase in 1972.



A colony of 3rd and 4th instar larvae feeding on old foliage. Note: Mid rib of individual needles are left after feeding. (1.5x)

SADDLEBACK LOOPER, *Ectropis crepuscularia* (D&S). An outbreak of this insect reported in 1969 has subsided after causing an estimated 1.3 million board feet of mortality over 200 acres at Connell Lake. The killing and defoliation was most evident in the dominant and codominant crown classes. No control was necessary. However, plans are now being made to salvage dead and dying trees.

Larval survey data indicate that low level populations exist at a few scattered locations in southeast Alaska. Larvae were found at 5 of 147 sampling locations with the largest number (2) found at Coning Inlet on Long Island. This looper is expected to remain at endemic levels in 1972.

GREEN-STRIPED FOREST LOOPER, *Melanolophia imitata*. Larval populations of green-striped looper were recorded at 21 of 147 sampling locations this past season. Five or more larvae were collected at three locations with the largest number (12) found at Princess Bay. The majority of these findings were in the warm-wet zone. The status of this insect is not known.

OTHER INSECTS

SPRUCE APHID, *Elatobium abietinum* (Wik). Spruce aphid populations, active at several locations in southeast Alaska last year, have subsided after causing some locally severe defoliation and tree killing.

The most serious damage occurred in the vicinity of Sitka, on State and private lands where several hundred aesthetically valuable Sitka spruce were killed. Additional severely defoliated trees are now being invaded by populations of spruce beetle which have developed in adjacent windthrown trees. Sample data indicates that aphid populations will be at a very low level in 1972.

COOLLEY SPRUCE GALL APHID, *Adelges cooleyi* (Gill). This aphid was active again at a few locations on the Kenai Peninsula and in the vicinity of Anchorage, but has subsided in southeast Alaska. Infestations on ornamental spruce produced a noticeable amount of tip galling which is resulting in stunted and deformed trees. Wild stands appear to be little affected. No control is being considered at this time.

NOCTUIID DEFOLIATOR, *Orthosia hibisci* (Guen). Extremely high populations of this moth have collapsed following one season of noticeable feeding over several hundred acres of mixed hardwoods at Bird Point along Turnagain Arm on the Kenai Peninsula.

The reasons for the decline include 27 percent pupal parasitism by a species of Aphanistes wasp and apparent physiological malformation resulting in an additional 50 percent reduction of pupae. Examination of samples of affected pupae by insect pathologists at the Forestry Science Laboratory at Corvallis, Oregon, failed to reveal any apparent pathogens. Damage to defoliated hardwoods was slight.

UNKOWN SAWFLY. Populations of a sawfly have severely defoliated alder stands at several locations in southeast Alaska.

The heaviest defoliation occurred over approximately 200 acres on three small islands at the mouth of the Stikine River near Wrangell, Alaska. The trend of these infestations is not known. No control is being considered in 1972.

UNKNOWN SPITTLEBUG. Populations of a spittlebug were observed on Sitka spruce seedlings in several of the clear-cuts within the Falls Creek Unit on Mitkof Island near Petersburg, Alaska. Damage to the seedlings was slight, although individual feeding punctures were observed. This damage occurred within an area that was fertilized with urea pellets in June of 1970. The trend of this infestation is not known.

DEFOLIATOR SURVEY

In June of 1971, a cooperative plan calling for an annual survey to sample larval defoliators in coastal Alaska forests was approved between Region 10 and the Forestry Sciences Laboratory, Juneau, Alaska.

The purpose of this survey is to obtain reliable data necessary for detection and prediction of insect outbreaks in coastal forests and to obtain additional information about distribution, cycles of abundance, biology, and taxonomy.

The survey data, recorded on temporary field forms and then transferred to IBM cards, will be used to determine the locations and characteristics of population epicenters with respect to climatic zones, aspect, site, stand structure, and stand age for comparison with local weather factors such as temperature, cumulative degree days and precipitation.

In addition, this information will be used to pinpoint where aerial detection coverage is needed and identify areas where impact and trend studies should be conducted.

Experience with last year's survey was quite satisfactory, considering that it was essentially a shakedown cruise. The field work was completed within the self imposed time limits and for less than the estimated cost. The use of this survey reduced the need for approximately 25 hours of aerial reconnaissance in southeast Alaska and resulted in a great deal of information concerning species distribution and relative numbers.

The 1972 survey will include some input concerning forest soils and will be increased to include an additional 25 sampling locations, 15 of which will be located in hemlock type in the Prince William Sound.

Collecting a beating sample from western hemlock in southeast Alaska. A sample consisting of beatings from three trees was taken from 147 separate locations in 1971.

LARVAL SAMPLING LOCATIONS IN SOUTHEAST ALASKA-1971

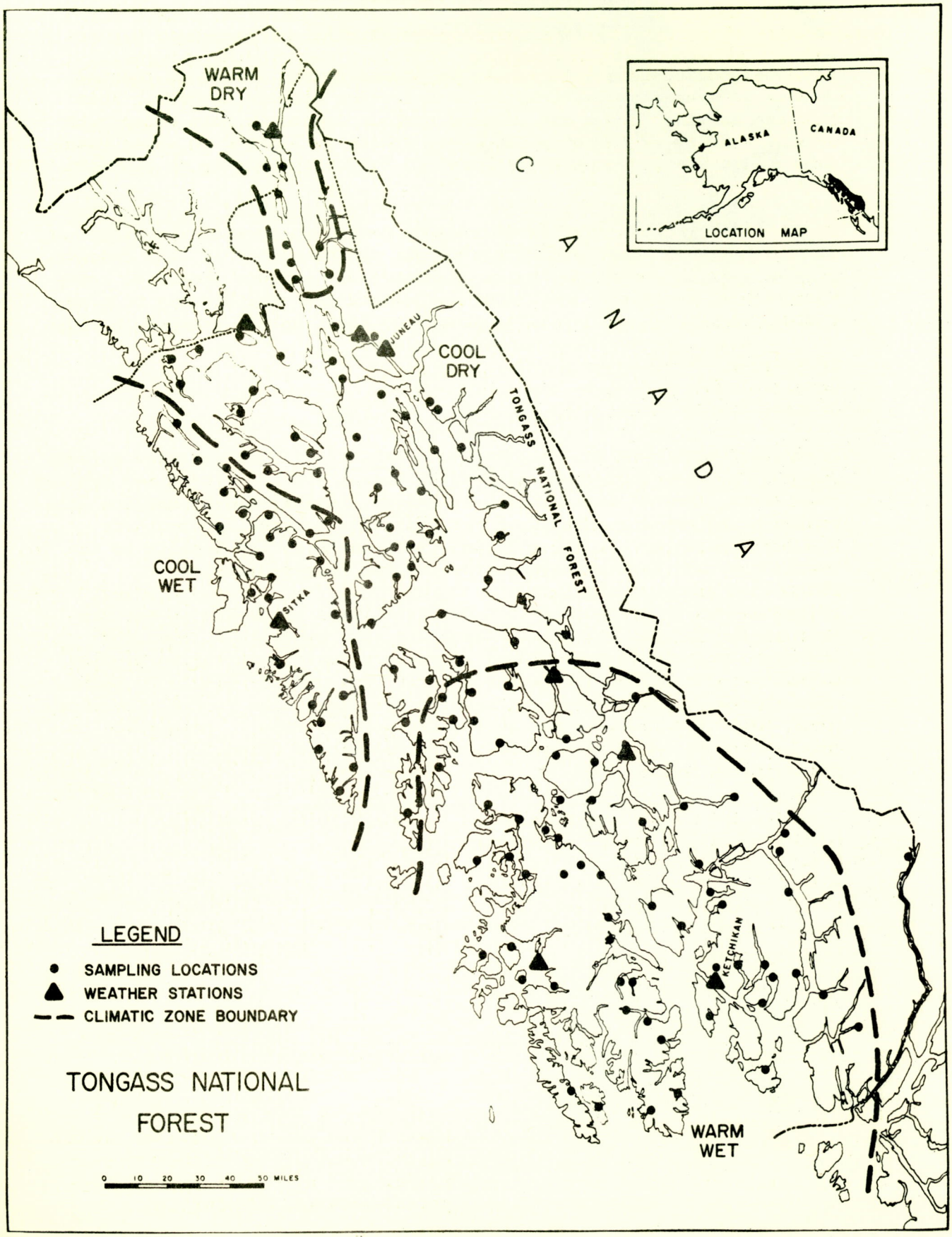


FIGURE 4

DISEASE CONDITIONS IN BRIEF

The most serious disease problem in second-growth stands in coastal Alaska is caused by dwarfmistletoe infecting western hemlock. This disease is wide spread and causing serious damage in many old-growth stands. However, infection in young stands is limited to areas where infected overstory trees have remained following logging or blowdown.

A tip and leader killing fungus tentatively identified as *Sirococcus strobilinus* (Preuss) was found causing damage in several locations. Little is known about the life cycle or pathogenicity of this disease. However, it is considered to be a potentially serious threat to young stands. There is some evidence to indicate that the disease or a related organism is also causing damage to Sitka spruce growing in close association with infected western hemlock.

STEM DISEASE OF CONIFERS

HEMLOCK DWARFMISTLETOE, *Arceuthobium tsugensis*. This parasite infects western hemlock throughout most of southeast Alaska. Infection centers have been observed as far north as Haines, Alaska, and at various locations on all of the islands of the Alexander Archipelago south to British Columbia. It has not been found north of Icy Straits to the west or on the Yakutat unit of the Chatham Ranger District.

An extensive examination of the dwarfmistletoe situation in western hemlock forests of southeast Alaska was made by Keith R. Shea and James L. Stewart in June 1970. An earlier field examination confined mostly to the Petersburg Ranger District was made by Donald P. Graham in July 1966. Both examining parties were unanimous in their reports that hemlock dwarfmistletoe is causing serious impact, comparable to that reported for many hemlock stands in British Columbia.

The impact includes growth loss, deformities and cull, general decadence, and predispositon of trees to damage or mortality from other causes. In dense young sapling stands the more heavily infected trees are so stunted that they are soon suppressed by their more vigorous neighbors.

Heavily infected hemlock overstory on very good site in Cholmondeley Sound.

Mistletoe damage is predicted to be greater in future stands than in present ones unless infected residuals remaining after current logging are cut or killed. Only a few infected residuals are required to reinfect an area of hemlock regeneration. Infection will, presumably, occur earlier than it did in the original stands and intensify more rapidly in these regenerating forests as long as an overstory source of infection remains.

Aerial shoots of female dwarfmistletoe plant on residual whip in 5 year old clearcut at McKenzie Inlet on Prince of Wales Island.

Although quantitive data for southeast Alaska is lacking, the available evidence suggests that growth and quality reduction caused by dwarfmistletoe warrant a program of direct control.

The present control program specifies cutting all residual hemlock whips 4 inches DBH or 4 feet tall and larger after clearcutting. The cost per acre for contracting this work has averaged approximately $14.00 per acre for the last three years. The residuals are cut as soon as possible after logging and in no case is removal deferred for more than ten years after logging.

Residual hemlock in clearcut at Hamilton Bay. A high percentage of these non-commercial trees contain dwarfmistletoe infection.

Preliminary control plans are based upon data collected at the time of the timber sale preparation. The data is supplemented by a presuppression survey which is made in preparation for specific control projects.

Reinfection of hemlock regeneration along cutting boundaries is not considered serious enough to justify additional expenditures for control in border areas. When the size of a cutting unit is less than 40 acres the relative importance of infected trees on the perimeter of the clearcut will increase. It may then be necessary to include these border infection sources in the control program. The same would apply where landscape management practices drastically increase the ratio of perimeter to area cutover.

All of the mistletoe control being done on current sales is financed by KV funds deducted from stumpage receipts for the sales area. The backlog of work on older sale areas, areas on which KV was not collected, is financed with I&DC funds.

HEMLOCK DIEBACK, *Sirococcus strobilinus* (Preuss). This pycnidial fungus disease is causing severe damage and minor amounts of mortality over an estimate 8,000 acres of western hemlock reproduction at Thomas Bay near Petersburg and Edna Bay on Kosciusko Island. Additional areas of lighter infection have been observed on Mitkof, Revillagigedo, and Prince of Wales Island.

Very little is known about this disease. It was tentatively identified by Dr. A. Funk, a forest pathologist with the Forest Research Laboratory, Victoria, B. C., Canada, in 1969. He reported it was an infectious disease, and that its incidence may be related to frost damage as well as other factors which weaken the host. A great deal of winter dying and frost damage occurred in southeast Aalska during the winter of 1968-1969, and the problem area in Thomas Bay was severely affected.

The first visible signs of infection by *Sirococcus strobilinus* are a fading and casting of needles on the terminal and/or lateral branch tips late in the growing season. Shortly after this, the leaders begin to shrivel and die. In this early stage, the symptoms look much like frost damage with only the tender young tips curling back and turning brown. Black fruiting bodies become visible later as the infection spreads down the shoot to kill the twig as far back as the two-year old growth. Young trees which have been severely affected appear broomed and bushlike--growth is greatly reduced and in some cases mortality occurs.

The disease appears to attack hemlock from 6 inches to about 30 feet in height. At Thomas Bay, trees in the 2-6 foot range seem to be most heavily infected, while at Edna Bay, trees in the 20-30 foot classes are the most severely affected. A comparison of data collected from plots established in the Thomas Bay area on September 1, 1971, and remeasured on October 18, 1971, illustrates the severity of the current infection. On September 1, of 255 trees tagged in 10 widely scattered locations, 66 percent were infected, with 26 percent showing symptoms on both the terminal and lateral branches. Several individual plots contained more than 90 percent infected trees. Six weeks later, on October 18, 100 percent of the tagged trees in all 10 locations showed some sign of infection.

The young second-growth stands in southeast Alaska are generally overstocked and so might benefit from some natural hemlock mortality. However, there is cause for concern about the rapid rate of spread of this disease as well as the apparent spread of this disease or an associated one to Sitka spruce.

Monitoring of the plots at Thomas Bay will be continued and additional plots are being established at Edna Bay on Kosciusko Island. Studies on the life cycle of the disease are imperative and research on the rate of development and pathogenicity of the disease are needed before a meaningful biological evaluation can be made.

GALL RUST, *Peridermium harknessii*. This fungus, a common gall producer on the native lodgepole pine in southeast Alaska, has been causing some concern to homeowners in the Sitka, Petersburg, and Ketchikan areas. Limb girdling and tree killing has been observed. However, the most common damage seems to be trunk malformation which results in reduced crown growth.

Homeowners who have made ornamental plantings or who are utilizing wildings as ornamentals may obtain a measure of control by pruning infected limbs or by removing heavily infected trees. No chemical control is recommended.

FOLIAGE DISEASES OF CONIFERS

NEEDLECAST, *Lophodermium pinastri*. Damage caused by this fungus disease was commonly observed on native lodgepole pine throughout southeast Alaska in 1971.

The infected trees, except for heavily infected seedlings, are normally not killed. The appearance of red or brown foliage is usually alarmingly out of proportion to the actual injury resulting from infection on older needles. No control measures are recommended.

NEEDLERUST, *Chrysomyxa ledicola* (Pk. Lagerli) (P. decorlorans). This rust caused quite spectacular and widespread discoloration on new growth of Sitka spruce throughout much of southeast Alaska during the summer of 1971. The warm, dry season was particularly favorable for full development of the fungus which utilizes labrador tea as an alternate host. A badly infected tree appears yellowish in color, and when shaken, gives off a dense cloud of yellow aecia spores.

Damage to the host trees, which include white, black and Sitka spruce is minimal. Mortality occurs only after several years of repeated infection. The climate of this area is such that conditions favorable for repeated infection normally would not occur. No control has been recommended.